IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:
Hideharu SATO
SERIAL NO. 09/155,635 GROUP ART UNIT: 1745
EXAMINER: Carol Chaney
FOR: LITHIUM ION SECONDARY BATTERY



DECLARATION UNDER 37 C.F.R. 1.132

HONORABLE COMMISSIONER OF PATENTS & TRADEMARKS
WASHINGTON, D.C. 20231

SIR:

Now comes Hideharu SATO, a citizen of Japan, and a resident of c/o Mitsubishi Chemical Corporation, Tsukuba Research Center, 3-1, Chuo 8-chome, Amicho, Inashiki-gun, Ibaraki-ken, Japan, who declares and says that:

1. received a doctor's degree in engineering from Tokyo Institute of Technology in March, 1995.

2. I have been employed by Mitsubishi Chemical Corporation since April 1995; and was engaged in the study of negative electrode for lithium ion secondary battery.

3. I am one of the inventors of U.S. Patent Application, Serial No. 09/155,635.

4. I have read the Office Action dated October 18, 1999, have understood the Examiner's rejection of the invention

claimed in the above application. Then, the following experiments for LONZA KS 6, 15, 25, 44 and 75 graphites were conducted.

(1) Measurement of particle size of LONZA KS 6, 15, 25, 44 and 75:

Particle size determination was made by using a laser diffraction type particle size analyzer. The automatically calculated average particle size was used as standard of evaluation.

(2) Measurement of specific surface area of LONZA KS 6, 15, 25, 44 and 75:

The specific surface area was measured according to the BET one-point method.

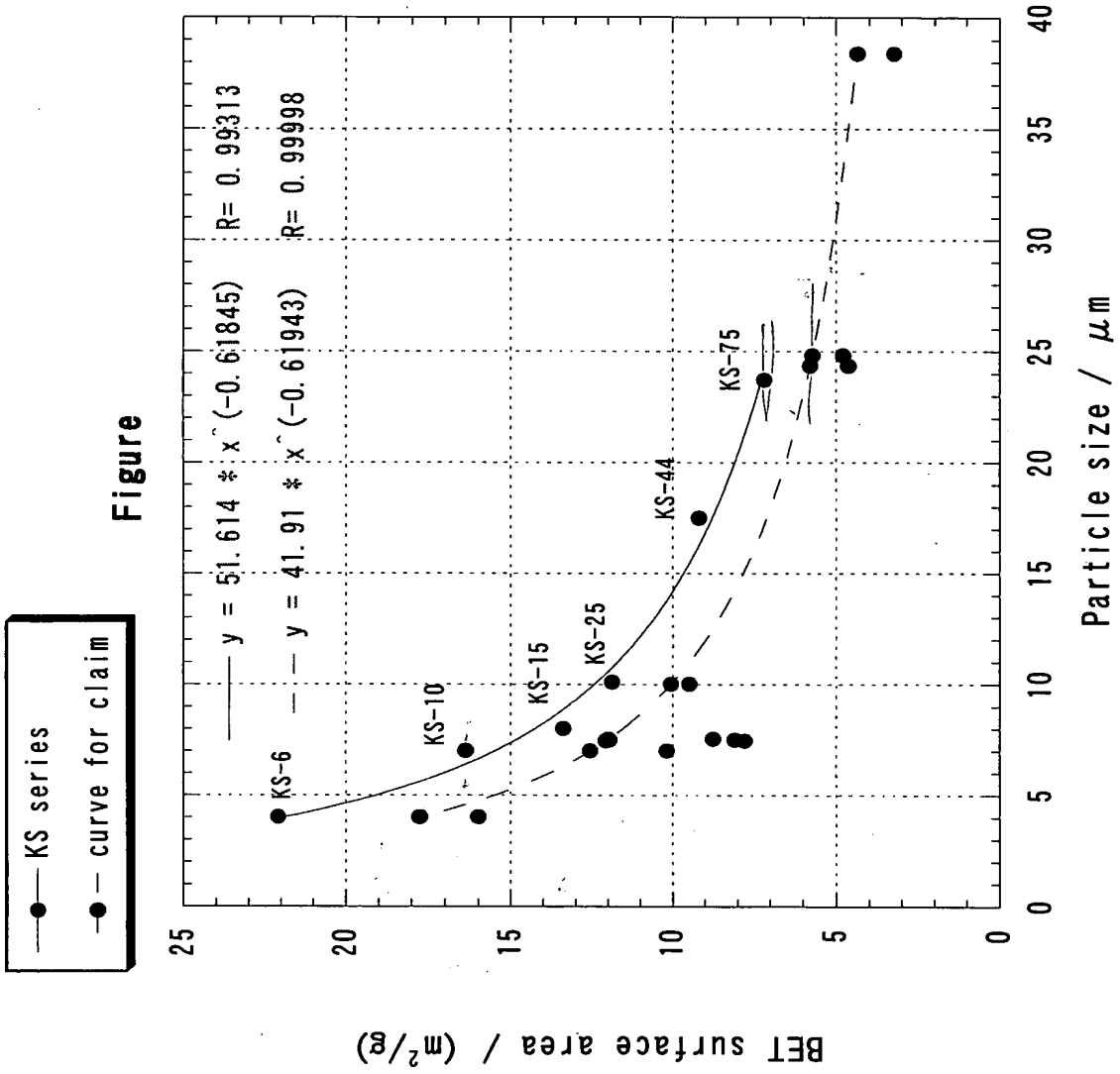
The results are shown in the following Table 1.

Table 1

| | Particle size | Specific surface area |
|---|---|---|
| LONZA KS 6 | 4.9 μm | 22.0 $m^2/g$ |
| LONZA KS 15 | 8.0 μm | 13.5 $m^2/g$ |
| LONZA KS 25 | 10.1 μm | 11.9 $m^2/g$ |
| LONZA KS 44 | 17.5 μm | 9.2 $m^2/g$ |
| LONZA KS 75 | 23.7 μm | 7.2 $m^2/g$ |

The values shown in Table 1 are collectively shown in the following figure. Also, the particle sizes and specific surface areas of graphite used in Examples of the present invention are collectively shown in the following figure.

**Figure**


KS series
curve for claim
y = 51.614 * x^(-0.61845) R= 0.99313
y = 41.91 * x^(-0.61943) R= 0.99998
KS-6
KS-10
KS-15
KS-25
KS-44
KS-75
BET surface area / (m²/g)
Particle size / μm
0
5
10
15
20
25
30
35
40

(4) Remarks

As seen from the above figure, the relationship of particle sizes and specific surface areas of LONZA KS graphite series is represented by the following formula.

$y=51.614x^{(-0.61845)}$

On the other hand, the relationship of particle sizes and specific surface areas in the present invention is represented by the following formula.

$y=42x^{(-0.6)}$

Therefore, the relationship of particle sizes and specific surface areas of LONZA KS graphite series is completely different from that of graphite used in Examples of the present invention.

5. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

6. Further, deponent saith not.

Date: March 9th, 2000

Hideharu Sato

Hideharu SATO

# 請求の範囲

1．正極、非水電解液、セパレーター及びリチウムイオンの充放電が可能な炭素材料を使用した負極を備えたリチウムイオン二次電池において、上記の負極が次の（a）及び（b）に規定する条件を同時に満足する黒鉛材料を一種以上含有することを特徴とするリチウムイオン二次電池。

(a) BET法比表面積をy（$m^2/g$）、粒径（$\mu m$）をxとした場合、下記の式（I）で表される領域内に存在する黒鉛材料。

$$y \leqq 52x^{-0.6} \quad (4 \leqq x \leqq 40、0.1 \leqq y \leqq 25) \cdots\cdots (I)$$

(b) 波長5145ÅのアルゴンイオンレーザーTC 1600 MAIL ROOM光を使用したラマンスペクトル分析において、1570～1620$cm^{-1}$の範囲に存在するピークの強度をIA、1350～1370$cm^{-1}$の範囲に存在するピークの強度をIBとした場合、その比であるR値（＝IB／IA）が0.001～0.2の範囲である。

2．黒鉛材料が下記の式（II）で表される領域内に存在する請求の範囲1に記載のリチウムイオン二次電池。

$$y \leqq 42x^{-0.6} \quad (4 \leqq x \leqq 30、0.1 \leqq y \leqq 20) \cdots\cdots (II)$$

3．黒鉛材料が次の（c）に規定する条件を満足する請求の範囲1に記載のリチウムイオン二次電池。

(c) 波長5145ÅのアルゴンイオンレーザーRECEIVED APR 13 2000光を使用したラマンスペクトル分析において、1570～1620$cm^{-1}$に存在するピークの半値幅である△v値の大きさが14～22の範囲である。

4．請求の範囲1～3に記載の黒鉛材料の表面を炭素化可能な有機材料で被覆し、焼成、粉砕して調製した「非晶質炭素被覆黒鉛系炭素質物」を負極として使用することを特徴とするリチウムイオン二次電池。